UTAH

FOREST WATER QUALITY GUIDELINES MONITORING

AUDIT REPORT

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF FORESTRY, FIRE AND STATE LANDS

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Utah's Forest Water Quality Guidelines

2006 Monitoring Program Report - Baseline Data

UTAH DEPARTMENT OF NATURAL RESOURCES
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EXECUTIVE SUMMARY

This report summarizes findings of Utah's Forest Water Quality Guidelines (FWQG) Monitoring Program for forestry activities during the period 2002-2005. The FWQG Monitoring Program was developed in response to Utah's Non Point Source Management Plan for Silvicultural Activities (1998) and the Utah Forest Practices Act (2001). Results are based on 40 audits (representing a 50% survey) conducted across the state on non-federal lands, and represent baseline data for Utah. Monitoring attempts to assess both the degree of FWQG implementation and effectiveness of minimizing or reducing non-point sources of pollution related to forestry activities.

Utah's Forest Water Quality Guidelines are a collection of voluntary field applicable practices designed to protect water quality during forestry activities. The FWQG were adopted by the State and are contained in Utah's Non-Point Source Management Plan. The 1998 Silviculture Addendum uses Forest Water Quality Guidelines as the basic management practice, and serves as the cornerstone for protecting forest resources and water quality. Properly applied, the FWQG can minimize non-point source pollution produced from timber harvesting activities.

The FWQG monitoring process consists of gathering information through field auditing timber harvesting activities, and qualitative evaluations of both the application and effectiveness of applicable FWQG practices. During the period 2002-2005, the Utah Division of Forestry, Fire and State Lands (FFSL) conducted post-harvest field audits on 40 sites. Over 1,500 applicable forest practices were rated. The audits are based primarily on visual assessments and professional judgement of those conducting the audits, and decisions are based on consensus among audit team members. This report provides baseline information and summarizes findings of Utah's FWQG Monitoring program for forestry.

The goals and objectives of Utah's FWQG Monitoring program are to develop and implement a forest water quality monitoring and evaluation program, and to demonstrate the application of the FWQG as being effective in reducing non-point source pollution and protecting forest, soil and water resources. To meet these objectives, FFSL identified the following strategies. Through a field review process:

- Determine if FWQG are being applied during timber harvesting operations. This is the process of systematically gathering information to determine whether FWQG are being applied and applied in the intended manner.

- Assess the relative effectiveness of FWQG at reducing non-point source pollution related to timber harvesting activities. This is the process of information gathering and evaluating whether the application of FWQG achieves the anticipated or desired resource protection.

- Identify and provide a feedback mechanism on the need to revise, clarify or strengthen the FWQG.

Data collection utilizes a field-based method designed to focus on assessing both the application and effectiveness of applicable FWQG. The intent of FWQG monitoring is to conduct on-site, post-harvest reviews for all timber harvesting activities occurring on state and private lands in the state. Assuming access is allowed, each site is given an evaluation by not less than a two-person assessment team. The team gathers information which will be used to evaluate FWQG application and effectiveness. Conducting this phase of the monitoring program is considered to be routine follow-up with landowners and is incorporated into the division's normal operating procedure.

Forty sites were evaluated for **FWQG application**. Audit results showed that across all ownerships, FWQG were properly applied 81% of the time. Although many harvest sites had at least one instance where a FWQG was inadequately applied, the majority of these departures were minor and did not cause erosion or deliver sediment to water resources.

Similarly, sites were evaluated for **FWQG effectiveness**. Audit results showed that across all ownership, FWQG were effective in protecting forest, soil and water resources 79% of the time. Minor departures in effectiveness produce minor impacts to forest, soil and water resources where erosion occurs but is not delivered to streams of other water resources.

Summary of FWQG Application and Effectiveness by Ownership

Practice	Ownership	
	State	Private
FWQG Application	81%	81%
FWQG Effectiveness	80%	78%

INTRODUCTION

Forests are an important natural resource in the state of Utah. Typically, Utah's forests are situated at elevations where precipitation is generous enough to allow trees to grow, and are covered with abundant coniferous and deciduous species. These forests make important contributions to the state's quality and way of life by providing numerous resource benefits such as wood fiber, fish and wildlife habitat, recreational opportunities and clean air and water. Being the second-most driest state in the West, clean water is essential to Utah's diverse economy.

Findings from the 1996 Utah Forest Practices Task Force indicate that timber harvesting on Utah's non-federal lands has increased in recent years. This trend is expected to continue as population and wood product demand continues to increase. Conducted improperly, timber harvesting sometimes leads to land degradation. The negative impacts of poor timber harvesting can include soil erosion, sedimentation and decline in water quality.

Nearly one-third of Utah's 53 million acres is occupied by forest mostly above 5,000 feet. These "timberlands" represent approximately 3.4 million acres. Roughly, 20% of the timberland in Utah is privately-owned with the remaining 80% being owned by the federal government.

Across the nation, natural resource managers and the public are concerned with impacts to water quality resulting from non-point source pollution. Non-point source pollution is defined as diffuse sources of water pollution that originate from many indefinable sources and do not discharge at a specific, single location. Non-point source pollutants are generally carried over or through the soil and ground cover via storm-flow processes (Non-point Source Management Plan for Silvicultural Activities, 1998). Eroded soil or sediment is the single-most non-point source pollutant affecting our nation's water resources (U.S. Environmental Protection Agency, 1992).

Many land uses cause non-point source pollution including agriculture, construction activities, urban and rural development and forest management activities. Nationally, it is estimated that between 3-9% of all non-point source pollution originates from forest management practices (U.S. Environmental Protection Agency, 2005). In Utah, estimates are difficult to obtain. However, it is generally assumed to be a small percentage of total non-point source pollution. But, local site conditions can cause serious water quality and other resource impacts (Utah Non-Point Source Management Plan, 2000). Also, the cumulative effects of pollution from many localized, small sources can have a significant impact on water quality.

Since the 1970s, non-regulatory Forestry Best Management Practices (BMPs) have provided guidance as minimum water quality protection standards for forestry operations. The 1987 amendment to the Clean Water Act of 1972 recognized the need for control strategies for non-point source pollution. The act directed states to identify land use activities that contribute non-point source pollution and to adopt measures to control those sources. Silviculture or forest management has been identified as a possible source of non-point source pollution.

The 1998 Silviculture Addendum to Utah's Non-Point Source Management Plan prescribes voluntary Forest Water Quality Guidelines to protect water quality, and outlines an implementation method for the promulgation and adoption of these guidelines. Utah's FWQG are similar to other states' forestry Best Management Practices (BMPs). In response, the Utah Division of Forestry, Fire & State Lands developed the FWQG Monitoring Program which functions within a non-regulatory and entirely voluntary framework.

Utah's Forest Water Quality Guidelines are a collection of voluntary measures landowners, loggers and resource managers can use to provide for the protection of forest, soil and water resources. Utah's FWQG are explained in the publications, ***Utah's Forest Water Quality Guidelines: A Practical User's Guide for Landowners, Loggers and Resource Managers****, and* ***Utah's Forest Water Quality Guidelines: A Technical Manual for Landowners, Loggers and Resource Managers***.

Prior to 2001, timber harvesting activities in Utah went largely unchecked due to the lack of information related to the location of these activities. There was no formal or legal process for operators or landowners to notify the Division of their intentions to harvest timber. The 2001 Utah General Legislative session enacted the Utah Forest Practices Act (H.B. 144). Under 65A-8a, the FPA requires operators to:

- Register with the Division of Forestry, Fire & State Lands.
- Provide notification of intent to conduct forest practices to the Division of Forestry, Fire & State Lands. The notification of intent must be submitted to the Division no later than 30 days prior to an operator commencing forest practices.

The **registration** requirement provides a mechanism that identifies who is operating in Utah. The **notification** requirement provides the means of identifying where forestry activities are occurring in the state. The FPA also provides direction to the Division of Forestry, Fire & State Lands to promote the implementation of the FWQG through technical assistance and education to landowners and loggers. Under the law, the Division of Forestry, Fire & State Lands is required to acknowledge receipt of all notifications and provide information on Utah's FWQG to operators and landowners.

Utah's FWQG audit process is a widely used and accepted means of evaluating forest practices. Monitoring and evaluation of the FWQG includes determining the level of awareness and acceptance of the FWQG, and field auditing of harvested sites to determine the degree of voluntary implementation and effectiveness of the FWQG which are designed to protect forest, soil and water quality. Implementation, or compliance monitoring, is a widely used and accepted method of evaluating forest practices, and serves as a surrogate for more expensive quantitative water quality sampling and monitoring.

Since BMPs and, in Utah's case, FWQG are recognized by state and federal legislation as a method to control non-point source pollution, it makes sense to validate their application and effectiveness as part of an overall monitoring program. States are increasingly relying on qualitative surveys to assess and monitor forestry practices. States such as Oregon, Idaho, Montana, Minnesota and Wisconsin all use a similar approach to Utah to assess control of non-point source pollution resulting from forest practices.

Assessing silvicultural impacts to water quality has been conducted previously in Utah. The first statewide assessment of forest practices was conducted in 1982. At that time, silviculture did not receive much attention. The consensus among land managers was that silviculture-related problems were insignificant. The rationale for arriving at this conclusion was based on the level of timber harvesting occurring in the state. At the time, approximately ninety-percent of the timber being harvested originated from federal land, while little information existed on the level of output from other lands in Utah and the potential impact on water quality. Findings from the 1982 report indicated only minor concerns related to silvicultural impacts (Kappe, 1982).

This report presents the first cycle of FWQG audit findings for Utah's monitoring program since 1982. It is anticipated that FWQG audits will be conducted on a continuous, on-going basis with accompanying reports being produced every three years.

METHODOLOGY

In Utah, assessing silvilcultural impacts and their relationship to non-point source pollution has occurred infrequently. Consequently, describing trends associated with timber harvesting activities on non-federal lands in Utah and their impact on water quality is difficult. This report presents the first cycle of FWQG audit findings for Utah's monitoring program in over 20 years. It is anticipated that FWQG audits will be conducted on a continuous, on-going basis with accompanying reports being produced on a three-year cycle.

Goals and Objectives

From the Division's perspective, the purpose of Utah's FWQG Monitoring Program is to effectively demonstrate application of the FWQG, and if they are providing the intended or desired protection to forest, soil and water resources. Through a field review process, a FWQG monitoring and evaluation program has been developed to systematically gather information to address the subjects of FWQG implementation and effectiveness within a qualitative context. The objectives of Utah's FWQG Monitoring Program are to:

1. Determine if the FWQG are being applied during timber harvesting operations.

2. Assess the relative effectiveness of the FWQG at reducing non-point source pollution related to timber harvesting activities.

3. Identify and provide a feedback mechanism on the need to revise, clarify or strengthen the FWQG.

Monitoring Approach and Strategy

Previously, monitoring efforts were hampered by the Division's inability to identify and locate where forest management activities were occurring on the landscape. With the passage of the Utah Forest Practices Act (FPA) in 2001, operators are required to notify the Division of their intent to conduct forest practices through the Notification of Intent (NOI) process. The Division now has a mechanism that provides a point of contact for operators and landowners and the location of forest practices.

Within the context of the FPA (which recognizes the need to promote the implementation of the FWQG before, during and after the conduct of forest practices), there is tacit approval from the state legislature to establish and conduct non-point source water pollution monitoring related to silvicultural activities. Furthermore, the 1998 Non-Point Source Management Plan for Silviculture Activities established the Forest Water Quality Guidelines and outlines an implementation method for the promulgation and adoption of the FWQG.

To be successful, Utah's FWQG Monitoring Program relies heavily on cooperation among landowners and other participating entities, particularly the forest products industry. Designed within a voluntary, non-regulatory framework, the FWQG Monitoring Program should be thought of in terms of an assessment or evaluation rather than something designed to bring about enforcement actions. Due to the qualitative nature of the monitoring process, monitoring forest practices is conducted in the relative sense as opposed to absolute quantification. For example, the intent of monitoring the FWQG is not to determine how much sediment is entering a stream. Rather, the focus is to determine if soil movement is evident, whether sediment is entering a stream and, if so, its potential or actual relative impact on water quality. Similarly, monitoring FWQG practices in this sense is not intended to identify poor operators or performance among the timber industry. However, it is understood that Utah's forest industry will be a leader and utilize the FWQG in a voluntary, self-policing fashion in an effort to provide desirable resource protection and long-term benefits. Acceptance and implementation of the FWQG within a voluntary context may forestall or preclude the need for future regulation of timber harvesting.

FWQG monitoring targets harvesting activities occurring on non-federal forest lands throughout Utah, and incorporates a combined, two-phased approach. Under the Division's monitoring strategy, **continuous monitoring** refers to auditing all timber harvesting activities on state and private lands, and is largely dependent upon operator compliance with the FPA Notification of Intent requirement and the Division's ability to conduct FWQG audits in a timely manner. **Periodic monitoring** consists of re-visiting selected sites, which meet specific criteria, previously evaluated under the continuous monitoring phase. **Findings reflected in this report are based entirely on FWQG audits conducted during the continuous monitoring phase.** Periodic monitoring will be implemented if determined to be warranted or if the need arises.

Development of Field Audit Process

Utah's FWQG audit process and procedures were developed by FFSL in consultation with the Division of Water Quality (DWQ). The audit process is based on the designs used by several states including Montana, Minnesota and Wisconsin. The process and procedures resulted in the following:

- Development of field audit rating guide and forms.
- Organization of calibration workshop(s) to ensure consistent application of rating standards.
- Development of consistency standards.
- Reporting results from field audits.
- Modification of the audit process if appropriate.

FWQG Audit Teams

Six audit teams were formed to conduct the audits, each representing their respective administrative area. Monitoring involved teams visiting and evaluating timber harvesting activities to determine if and to what extent the FWQG were being applied. To improve credibility and consistency among the teams, each was comprised of at least a two-person team. In the majority of cases during the field auditing, teams were comprised of three persons including an area representative (Area Manager or Area Forester), administrative staff, and program manager (Forest Management). It should be noted that every attempt was made to solicit participation in the audit process from other state, federal and local agencies, landowners and forest industry.

Photo 1: Audit Team conducting post-harvest FWQG Audit.

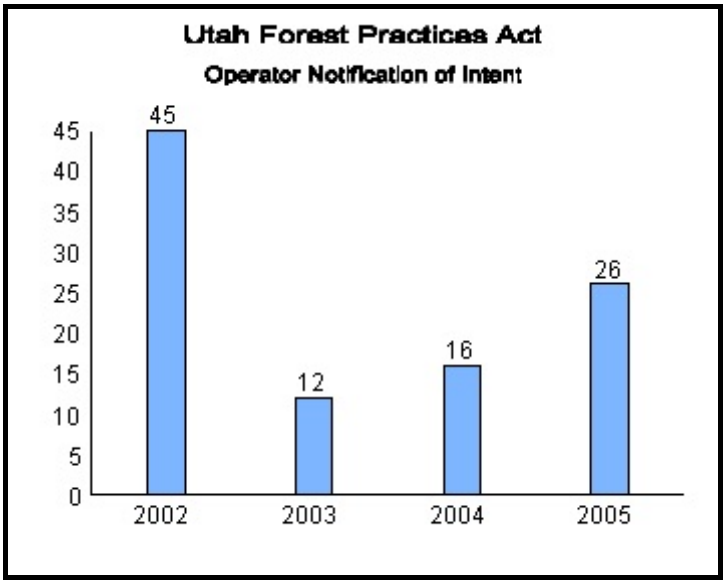
The Study Area

The study area encompasses the entire state of Utah, which is divided into six administrative areas. With the exception of the Central Area, at least one FWQG audit was conducted in each of the following administrative areas:

Administrative Area	Counties
Bear River	Cache, Rich, Box Elder and Weber
Wasatch Front	Davis, Morgan, Salt Lake, Tooele and Utah
Northeast	Wasatch, Summit, Duchesne, Uintah and Daggett
Central	Millard, Wayne, Piute, Juab, Sevier and Sanpete
Southeast	Carbon, Emery, Grand and San Juan
Southwest	Beaver, Garfield, Kane, Iron and Washington

Sample Size and Distribution

Under the continuous monitoring phase, there is no specific target for the number of sites to be audited. Through the FPA - Notification of Intent process, continuous monitoring proposes to conduct post-harvest audits on all timber harvesting activities occurring on non-federal lands in Utah. During the years 2002-2005, the Division received **99** notifications to conduct forest practices. The following graph displays the number of NOI received:



Since 2002, the Division has seen a decline in the number of NOI being submitted by operators, although a gradual increase has occurred over the past three years. While the FPA requires operators to notify the Division of their intent to conduct forest practices, there are no enforcement authorities or penalties for operators who do not comply with the requirement. Based on documented accounts, the Division is aware of several timber harvesting operations where no NOI has been received. In the past year alone, it is estimated there were 20 active timber harvesting operations occurring on private land without the Division being notified. This figure represents roughly 43% of the timber harvesting activities in 2005 where no documented notification of intent exists. In some cases, assistance in preparing the NOI had been provided to operators, yet they still failed to submit the NOI to the Division. Uncertainties exist about the level of FWQG compliance with these unreported activities. Several other factors may also explain the reason for declining NOI:

- Increase timber harvesting on federal lands.
- Less reliance on timber from private forest lands.
- Importing raw materials from other areas.
- Loss of industry/jobs and operators moving out of state.
- Landowners not selling or poor market conditions.
- Operators unaware of the registration and notification requirement.

A total of 43 sites were audited during this same period. However, three audits were determined to be of little value due to insufficient data and are not included in this assessment. The remaining 40 sites are distributed across the state. Audits were conducted on two ownership groups:

- Non-industrial private forest land (NIPF).
- State trust lands (SITLA).

An associated issue that affects the number of potential audits is that of access. Monitoring is voluntary, and thus permission to access a site must be granted by those who own the land. The School and Institutional Trust Lands Administration (SITLA) has agreed to allow access to audit sites. However, with non-industrial private forest landowners (NIPF), the Division must obtain permission from each individual landowner prior to conducting an audit on their property. The Division initiates follow-up action with both landowners and operators subsequent to receipt of an NOI through written and verbal requests. An unsuccessful response from the landowner is determined to be a denial of access to enter the property. Access to conduct FWQG audits on private forest lands was denied on 14 occasions.

Table 1: FWQG Audit Sample Size

FWQG Audits	Ownership		Total
	Private (NIPF)	State (SITLA)	
Audit Sites	33	7	40
% Audited	83	17	100
Notification of Intent (NOI)			
Total	Inactive	Denied Access	Audits*
99	3	14	82

*Reflects the maximum number of FWQG audits in the sample size.
Of the 82 possible audits, 40 audits (49%) were conducted.

Site Selection

Since continuous monitoring targets all harvesting activities occurring across the state on non-federal lands, consideration of site selection criteria and distribution is not warranted.

The Audit Rating Form

Audit teams used a rating form to determine and evaluate both FWQG application and effectiveness. Each audit site has a potential maximum of 76 FWQG practices. Rating FWQG application and effectiveness for each practice used a 5-point scale and 6-point scale respectively. The FWQG Audit Rating Form and Procedures for Conducting FWQG Audits are included in the Appendix.

Audit teams rated FWQG application first by identifying whether the FWQG was applicable to the site and, if so, whether it was applied in the correct manner and in the proper location. To help with determining application and effectiveness rating, audit teams employed the use of the flow chart described in the Appendix. Lack of adequate application or misapplication are considered departures from the FWQG. Audit teams employed the use of the following rating guide when considering FWQG application:

5 - operation exceeds FWQG
4 - operation meets FWQG
3 - minor departure from FWQG
2 - major departure from FWQG
1 - gross neglect of FWQG

Ratings of 5 and 4 are self-explanatory. Minor departures from the FWQG **(rating 3)** refers to departures of small impact potential distributed over a localized area, or over a larger area where the potential for impact(s) is low. Major departures from the FWQG **(rating 2)** refers to departures of large impact potential or to the FWQG not being applied. Gross neglect **(rating 1)** refers to large and direct impacts being clearly evident and disregard for FWQG application.

Similarly, audit teams rated FWQG effectiveness to determine the relative degree of providing expected or desired protection to forest, soil and water resources. Guidance for rating FWQG effectiveness is defined by the following:

6 - improved protection of forest, soil and water resources
5 - adequate protection of forest, soil and water resources
4 - minor and temporary impacts on forest, soil and water resources
3 - minor and prolonged impacts on forest, soil and water resources
2 - major and temporary impacts on forest, soil and water resources
1 - major and prolonged impacts on forest, soil and water resources

Definition of Terms	
Adequate	FWQG applied correctly; small amount of material eroded; material does not reach drainages, streams, lakes or wetlands
Minor	FWQG applied incorrectly; small impact potential; erosion and delivery of material to water resources not clearly evident
Major	FWQG not applied; large impact potential; erosion and delivery of material to water resources clearly evident
Temporary	Impacts lasting one year or less; no more than one runoff season
Prolonged	Impacts lasting more than one year

There are a maximum number of 76 FWQG practices to rate on each site if all FWQG are applicable. In most cases, however, not all FWQG applied. In several instances, sites did not have streamside management zones, stream crossings or forested wetlands. In others, treatment and disposal of slash was not completed or the FWQG could not be rated during the time of the audit. Those FWQG having to do with timing of operations during the harvest cannot be rated post-harvest. Hence, in these cases, the teams did not rate these practices. Given that 40 audits were conducted, the maximum number of practices that could have been evaluated was 3,040. On average, roughly half (49.8%) of all practices (1,515) were evaluated on all sites contained in the study area.

FWQG Audit Limitations

The FWQG auditing process is based largely on a one "point-in-time" qualitative visual observation of the site, most often looking for evidence of erosion and sedimentation. Typically, this approach documents impacts that normally occur during the first or second year after harvest. This is generally the critical period for erosion associated with timber harvesting. Some practices conducted during the operation cannot be easily evaluated in post-harvest audits. The assessment is based on visual appraisals of practices and impacts to forest, soil and water resource, and are a snapshot in time of the applied practices and subsequent impacts. It is understood this sort of qualitative evaluation is not as precise as more expensive quantitative methods. Nevertheless, the FWQG audit process is an effective means to evaluate their implementation and provides valuable information in a cost-effective manner.

RESULTS AND DISCUSSION

During the period 2002-2005, 40 sites were audited for voluntary FWQG compliance (Tables 2 and 3). The sites were distributed throughout the state with the highest proportion of sites located in the southeast area (45%) and northeast area (28%). By far, the majority of the FWQG audits were conducted on NIPF lands (83%) while state-owned lands (SITLA) accounted for 17% of the audit sites. Carbon, Emery and Duchesne counties accounted for almost sixty-percent of the FWQG audits conducted. A total of 1,515 individual practices were rated.

The majority of rated practices were associated with timber harvesting and activities related to road construction and skid trails. Few practices were rated for streamside management zones (SMZ), chemical management, prescribed fire and forested wetlands.

Table 2: FWQG Audits Completed by Year and Ownership Group

Ownership	Year				
	2002	2003	2004	2005	Total
Private	3	11	6	13	**33**
State	1	2	0	4	**7**
Total	**4**	**13**	**6**	**17**	**40**

Table 3: FWQG Audits Completed by Area for Each Ownership Group

Ownership	Number of Sites Audited						
	Bear River	Wasatch Front	Northeast	Central	Southeast	Southwest	Total
Private	1	5	9	0	15	3	**33**
State	0	1	2	0	3	1	**7**
Total	**1**	**6**	**11**	**0**	**18**	**4**	**40**

Statewide Application of FWQG

Proper application of the FWQG by landowners, operators and resource managers requires the selection and installation of the appropriate FWQG that collectively prevent or minimize impacts to forest, soil and water resources.

Audit teams rated a total of 1,515 practices to assess how landowners and operators applied the FWQG during timber harvesting activities. Application of the FWQG measures whether they were applied, whether they were applied correctly and whether they were applied in the proper locations on the harvested area. Tables 4 and 5 display statewide results relevant to FWQG application.

Table 4: FWQG Practices Rated by Ownership Group

	State		Private	
Practices Rated	**Application**	**Effectiveness**	**Application**	**Effectiveness**
Streamside Management Zone	0	0	71	71
Planning for Roads	27	27	141	141
Road Construction	25	25	127	127
Stream Crossings	4	4	66	66
Road Maintenance	24	24	106	106
Skid Trails	38	38	188	188
Landings	26	26	138	138
Timber Harvesting	40	40	230	230
Site Prep, Regen. & Revegetation	22	22	106	106
Chemical Management	3	3	27	27
Prescribed Fire	4	4	64	64
Forested Wetlands	0	0	38	38
Total Practices Rated	**213**	**213**	**1,302**	**1,302**

Table 5: Statewide FWQG Application - Percent (%) Practices Rated

Ownership	# Rated Practices	Meet or Exceed (4 and 5)	Minor Departure (3)	Major Departure (2)	Gross Neglect (1)
Private	1,302	81	14	4	<1
State	213	81	15	5	0
All Sites	**1,515**	**81**	**14**	**4**	**<1**

Table 6: Statewide FWQG Application - Number of Departures

Ownership	# Rated Practices	Minor Departure (3)	Major Departure (2)	Gross Neglect (1)
Private	1,302	368	110	6
State	213	62	20	0
Total	**1,515**	**430**	**130**	**6**

Explanation

The preceding results indicate that voluntary compliance with Utah FWQG is relatively high. Overall, the vast majority of rated practices were applied correctly 81% of the time (Table 5). Collectively, 566 departures (37%) occurred across all ownerships, with the majority being only minor departures. Of the 1,515 rated practices, 430 were minor departures (28%). Major departures and gross neglect were found less than 9% and less than 1%, respectively of the rated practices.

Statewide Effectiveness of FWQG

FWQG effectiveness measures how well (relatively) the FWQG protects forest, soil and water resources. Audit teams rated a total of 1,515 practices for FWQG effectiveness. Tables 6 and 7 summarizes FWQG effectiveness of all audited practices by ownership.

Table 7: Statewide FWQG Effectiveness - Percent (%) Practices Rated

Ownership	# Rated Practices	Improved Protection (6)	Adequate Protection (5)	Minor/ Temporary Impacts (4)	Minor/ Prolonged Impacts (3)	Major/ Temporary Impacts (2)	Major/ Prolonged Impacts (1)
Private	1,302	<1	78	17	3	1	<1
State	213	0	80	20	<1	0	0
All Sites	**1,515**	**<1**	**79**	**19**	**2**	**<1**	**<1**

Table 8: Statewide FWQG Effectiveness - Number of Impacts

Ownership	# Rated Practices	Minor/ Temporary (4)	Minor/ Prolonged (3)	Major/ Temporary (2)	Major/ Prolonged (1)
Private	1,302	454	76	28	22
State	213	84	2	0	0
Total	**1,515**	**538**	**78**	**28**	**22**

Explanation

Overall, adequate protection of forest, soil and water resources was achieved 79% of the time (Table 7). Collectively, 666 departures (44%) occurred across all ownerships, with the majority being minor and temporary impacts. Of the 1,515 rated practices, 538 were minor and temporary impacts (36%) and 78 major and prolonged impacts (5%) associated with FWQG effectiveness. Major impacts (temporary or prolonged) accounted for less than 2% of the impacts across the state.

FWQG Application for Each Forest Management Activity

Table 9 describes the relative degree of FWQG application for each of the forest management activities rated at each harvesting site across all ownerships.

Table 9: Forest Management Activity - FWQG Application

Forest Management Activity	# Rated Practices	FWQG Application - Percent (%) Practices Rated			
		Meet or Exceed (4 and 5)	Minor Departure (3)	Major Departure (2)	Gross Neglect (1)
Streamside Mgm't Zone (SMZ)	71	92	6	1	1
Roads (planning)	168	79	17	4	0
Roads (construction)	152	64	24	12	0
Roads (maintenance)	130	81	17	1	1
Stream Crossings	70	86	14	0	0
Skid Trails	226	77	17	6	0
Landings	164	89	9	2	0
Timber Harvesting	270	83	11	6	1
Site Prep, Regen. & Reveg.	128	78	18	4	0
Chemical Mgm't	30	90	7	3	0
Prescribed Fire	68	94	6	0	0
Forested Wetlands	38	89	11	0	0

Explanation

The majority of rated practices (78%) were associated with road related activities - planning, construction, maintenance - stream crossings, skid trails and landings and timber harvesting. Activities associated with chemical management and forested wetlands were the fewest rated practices.

Results by Area - FWQG Application and Effectiveness

Tables 10 and 11 display FWQG application and effectiveness results by each of the Division's geographic areas for all FWQG across all ownerships.

Table 10: FWQG Application by Administrative Area

Area	# Practices Rated	FWQG Application - Percent (%) Practices Rated			
		Meet or Exceed (4 and 5)	Minor Departure (3)	Major Departure (2)	Gross Neglect (1)
Bear River	29	38	45	17	--
Wasatch Front	159	79	15	6	--
Northeast	350	74	14	11	1
Central	--	--	--	--	--
Southeast	899	86	13	1	--
Southwest	78	82	18	--	--

Table 11: FWQG Effectiveness by Administrative Area

Area	# Practices Rated	FWQG Effectiveness - Percent (%) Practices Rated					
		Improved Protection (6)	Adequate Protection (5)	Minor/ Temporary Impacts (4)	Minor/ Prolonged Impacts (3)	Major/ Temporary Impacts (2)	Major/ Prolonged Impacts (1)
Bear River	29	--	45	28	17	10	--
Wasatch Front	159	--	70	19	5	0.6	6
Northeast	350	--	65	27	7	0.5	--
Central	--	--	--	--	--	--	--
Southeast	899	--	85	14	0.1	0.8	0.2
Southwest	78	3	82	15	--	--	--

Explanation

Photo 2: Properly constructed logging road.

Upon examination, few strong conclusions can be made from the preceding information which is largely due to the relatively small number of practices rated in some instances. For example, only 29 FWQG practices (1 audit) were rated in the Bear River Area, and only 78 FWQG practices (4 audits) were rated in the Southwest Area. And while there were no FWQG practices (0 audits) rated in the Central Area, there are several active operations occurring. Hence, it is an unfair assumption to conclude that the FWQG aren't being applied nor being effective at minimizing non-point source pollution in these areas. Similarly, it is unfair to conclude that FWQG application and effectiveness in the Wasatch Front Area - where the FWQG are providing adequate protection to forest, soil and water resources 70% of the time - are being applied to any lesser degree as in the Southeast Area (85%). In other words, there is no great disparity in the findings between each of the areas.

Application and Effectiveness of Specific FWQG

Practices associated with roads (planning, construction & maintenance), skid trails and landings and timber harvesting accounted for the majority of rated practices. Combined, there were a total of 1,110 rated practices (73%) for these activities.

Roads

Roads accounted for 41% of the rated practices. There are seventeen (17) specific FWQG practices associated with roads. A total of 450 FWQG practices were rated across all ownerships statewide (Table 12).

Table 12: FWQG Practices - Roads

	Ownership		
FWQG	**State**	**Private**	**Total**
Planning for Roads	27	141	**168**
Road Construction	25	127	**152**
Road Maintenance	24	106	**130**
Total	**76**	**374**	**450**

Taken as a whole, Tables 13 and 14 show statewide FWQG application and effectiveness rating for roads, which includes planning, construction and maintenance. In this instance, FWQG application was met or exceeded 75% of the time with a corresponding effectiveness rating of 69%.

Table 13: Statewide FWQG Application (Roads) - Percent (%) Practices Rated

Ownership	# Rated Practices	Meet or Exceed (4 and 5)	Minor Departure (3)	Major Departure (2)	Gross Neglect (1)
Private	374	75	19	6	<1
State	76	75	20	5	--
All Sites	**450**	**75**	**19**	**6**	**<1**

Table 14: Statewide FWQG Effectiveness (Roads) - Percent (%) Practices Rated

Ownership	# Rated Practices	Improved Protection (6)	Adequate Protection (5)	Minor/ Temporary Impacts (4)	Minor/ Prolonged Impacts (3)	Major/ Temporary Impacts (2)	Major/ Prolonged Impacts (1)
Private	374	--	68	24	5	<1	2
State	76	--	73	27	--	--	--
All Sites	**450**	**--**	**69**	**25**	**4**	**<1**	**1**

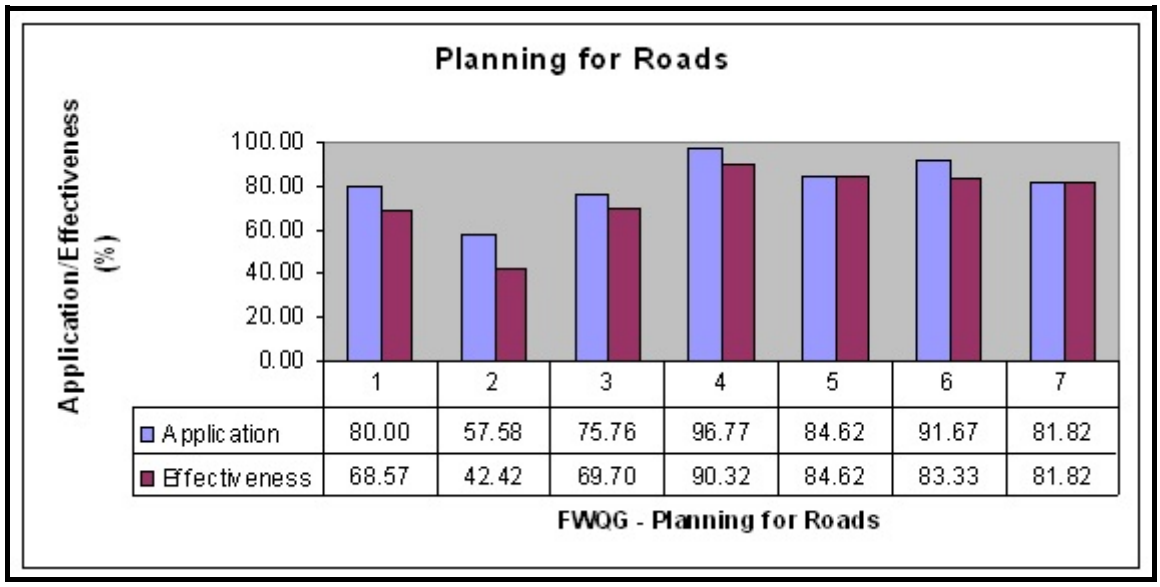
Planning for Roads

More specifically, of the 17 FWQG practices associated with roads, seven are directly related to planning for roads. Results show an average compliance rating (application rating 4 and 5) of 81%. Figure 1 displays results of the specific FWQG rated in this category for both FWQG application and effectiveness. In this case, FWQG 4 and 6 had the highest ratings - 97% and 92%, respectively. These FWQG refer to constructing roads in unstable areas and selecting the most appropriate stream crossing. FWQG 2 - road location and design; drainage - was rated the lowest at 58%.

Forest Water Quality Guideline (Planning for Roads)

1. Plan roads to fit within transportation networks, and that fit the natural terrain as much as possible. Minimize road construction, cuts, fills and the number of roads within the harvest area.
2. Locate and design roads upslope of natural drainages to allow road surfaces to drain. Road surface slope should utilize natural drainage as much as possible. Design cross culverts, ditches, dips, water bars to direct water off road surface.
3. Avoid sustained excessive grades of 10-20%.
4. Avoid road construction in unstable areas.
5. Minimize the number of stream crossings. Cross streams at right angles to reduce sedimentation and debris from entering the stream.
6. Select the most appropriate stream crossing (ford, culvert, bridge).
7. Design stream crossings to handle peak runoff and flood waters.

Figure 1: FWQG Application/Effectiveness - Planning for Roads



Road Construction

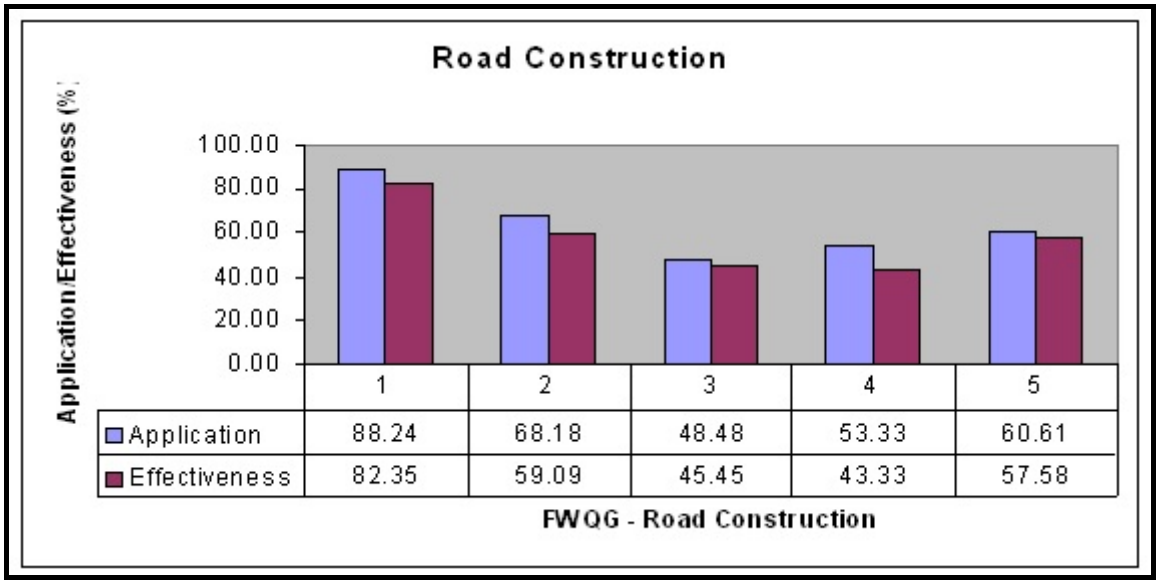
Of the 17 FWQG practices associated with roads, five are specific to road construction. Results show an average compliance rating (application 4 and 5) of 64%. Figure 2 displays results of the specific FWQG rated in this category. FWQG 1 which deals with limiting road construction activities during wet periods or when the ground is frozen represented the highest application rating of 88%. FWQG 3 referring to adequate drainage from the road surface was rated the lowest at 48%.

Photo 3: Road failure due to poor construction.

Forest Water Quality Guideline (Road Construction)

1. Limit road construction activities during periods of excessive moisture or frozen ground.
2. Roads constructed to prevent excess material (debris, soil) from entering stream.
3. Road constructed to provide adequate drainage from the road surface with appropriate features to reduce erosion.
4. Dips, water bars and culverts are constructed to effectively provide surface flow off the road.
5. Avoid constructing berms that may channel water down the road.

Figure 2: FWQG Application/Effectiveness - Road Construction



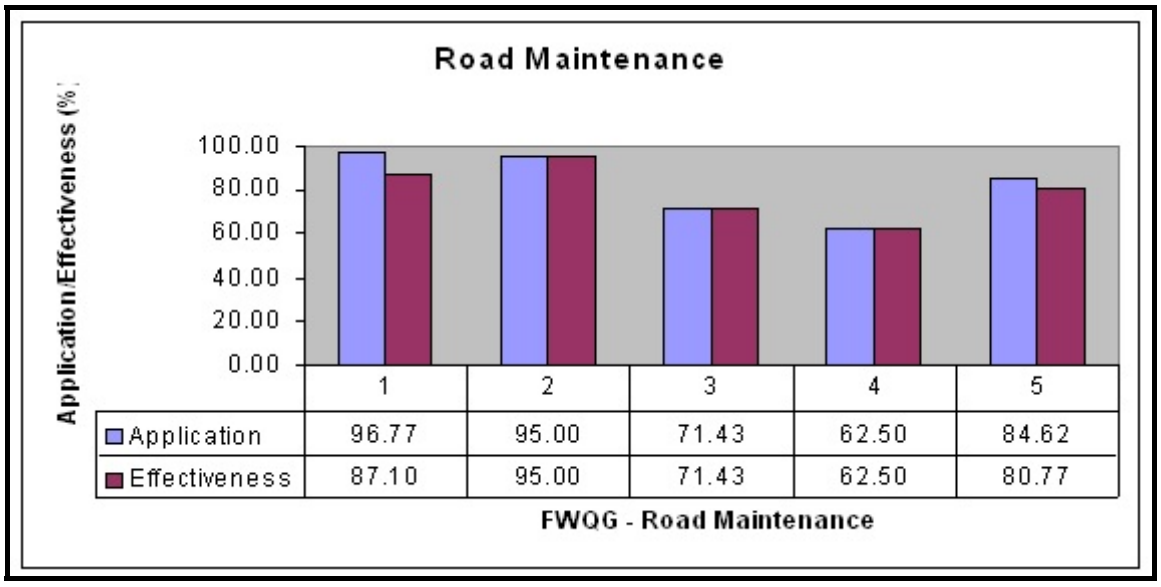
Road Maintenance

Of the 17 FWQG practices associated with roads, five are specific to road maintenance. Results show an average compliance rating (application 4 and 5) of 82%. Figure 3 displays results of the specific FWQG rated in this category. FWQG 1 and 2 represented the highest ratings of 97% and 95%, respectively. These FWQG refer to the avoidance of road maintenance unless necessary. FWQG 4 - avoid using roads during wet periods - was rated the lowest at 63%.

Forest Water Quality Guideline (Road Maintenance)

1. Avoid grading unless maintenance is necessary. Unnecessary grading creates additional source of sediment.
2. Avoid cutting the toe-slope when grading roads or pulling ditches.
3. Avoid placing side-cast material, soil and gravel into streams, SMZ's or other water bodies. Excess material produced from grading should be feathered out or hauled away.
4. Avoid using roads during wet periods.
5. Erosion control features are periodically inspected and maintained.

Figure 3: FWQG Application/Effectiveness - Road Maintenance



Skid Trails and Landings

Skid trails and landings accounted for 35% of the rated practices. There are twelve (12) specific FWQG practices associated with skid trails and landings. A total of 390 FWQG practices were rated across all ownerships statewide (Table 15).

Table 15: FWQG Practices - Skid Trails and Landings

	Ownership		
FWQG	**State**	**Private**	**Total**
Skid Trails	38	188	**226**
Landings	26	138	**164**
Total	**64**	**326**	**390**

On the whole, Tables 16 and 17 show statewide FWQG application and effectiveness rating for skid trails and landings. In this instance, FWQG application was met or exceeded 82% of the time with a corresponding effectiveness rating of 80%.

Table 16: Statewide FWQG Application (Skid Trails and Landings)
Percent (%) Practices Rated

Ownership	# Rated Practices	Meet or Exceed (4 and 5)	Minor Departure (3)	Major Departure (2)	Gross Neglect (1)
Private	326	83	13	4	--
State	64	84	12	4	--
All Sites	**390**	**82**	**13**	**4**	**--**

Table 17: Statewide FWQG Effectiveness (Skid Trails and Landings)
Percent (%) Practices Rated

Ownership	# Rated Practices	Improved Protection (6)	Adequate Protection (5)	Minor/ Temporary Impacts (4)	Minor/ Prolonged Impacts (3)	Major/ Temporary Impacts (2)	Major/ Prolonged Impacts (1)
Private	326	--	77	18	2	1	<1
State	64	--	84	16	--	--	--
All Sites	**390**	**--**	**80**	**17**	**2**	**1**	**<1**

Skid Trails

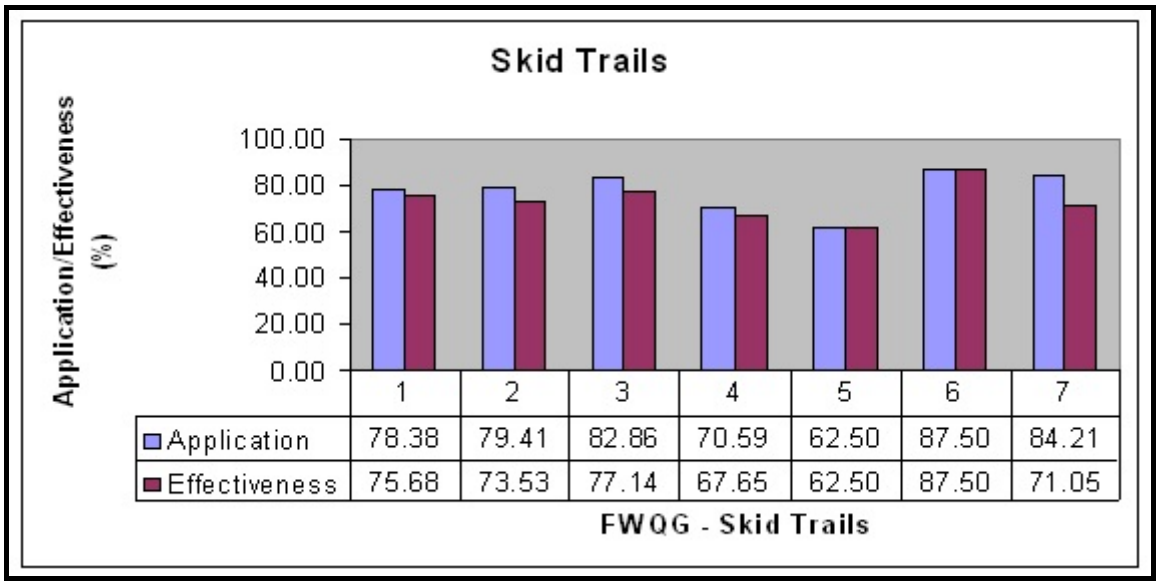
Of the 12 FWQG practices associated with skid trails and landings, seven are specific to skid trails. Results show an average compliance rating (application rating 4 and 5) of 78%. Figure 4 displays results of the specific FWQG rated in this category. FWQG 6 had the highest rating of 88%. FWQG 5 - use of appropriate water diversion devices to control erosion - was rated the lowest at 63%.

Photo 4: Evaluating skid trail construction and location.

Forest Water Quality Guideline (Skid Trails)

1. Skid trails and skidding operations designed and located to minimize soil disturbance.
2. Avoid skidding directly up and down steep slopes for long distances.
3. Skid trails located away from natural drainage systems. Avoid concentrating runoff and limit grad where possible.
4. Minimize skidding during wet periods to limit soil displacement and compaction.
5. Appropriate water diversion devices installed to prevent channelization and erosion on skid trails.
6. Locate skid trails outside SMZ's.
7. Utilize appropriate skidding method commensurate with soil and topography.

Figure 4: FWQG Application/Effectiveness - Skid Trails



Landings

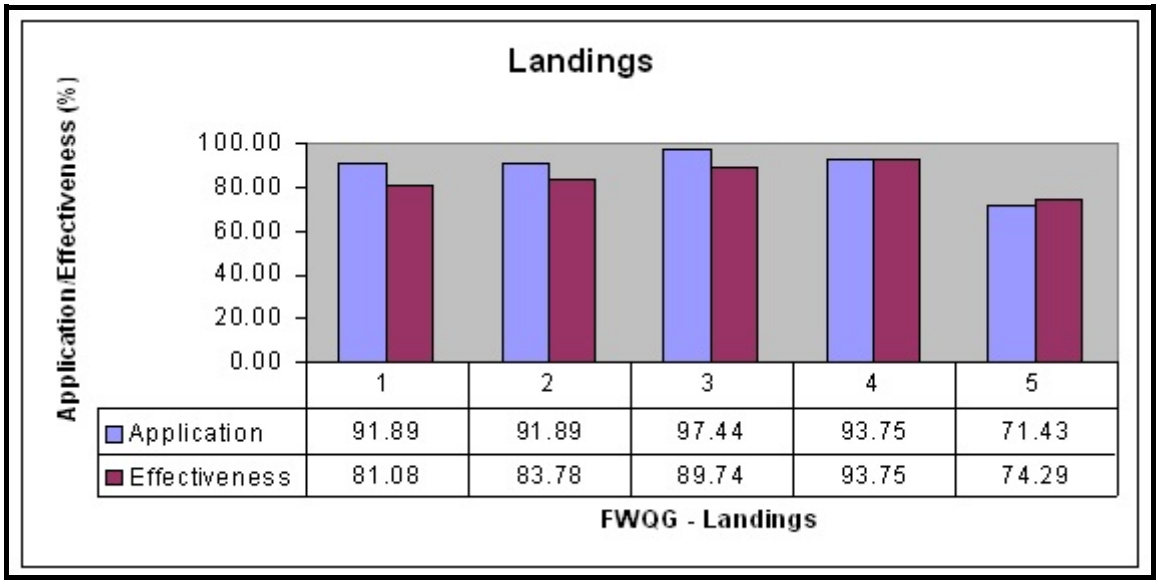
Of the 12 FWQG practices associated with skid trails and landings, five are specific to landings. Results show an average compliance rating (application rating 4 and 5) of 89%. Figure 5 displays results of the specific FWQG rated in this category. With the exception of FWQG 5, results were relatively comparable across the board. The low rating for FWQG 5 suggests that little attention was given to restoring landings to pre-harvest conditions.

Photo 5: Landing site re-contoured and re-seeded.

Forest Water Quality Guideline (Landings)

1. Landings located away from natural drainage systems and divert runoff to areas where vegetation can serve as a filter. For proper drainage, landings should be constructed with 3 to 10% slopes.
2. Locate landings to avoid skidding down and across drainage bottoms.
3. Minimize number and size of landings.
4. Landings should be located outside SMZ's.
5. Upon termination of operations, landings should be re-contoured, re-vegetated and returned to a natural condition.

Figure 5: FWQG Application/Effectiveness - Landings



Timber Harvesting

Timber harvesting accounted for 24% of the rated practices. There are nine (9) specific FWQG practices associated with timber harvesting. A total of 270 FWQG practices were rated across all ownerships statewide (Table 18).

Photo 6: Timber harvesting activity.

Table 18: FWQG Practices - Timber Harvesting

	Ownership		
FWQG	**State**	**Private**	**Total**
Timber Harvesting	40	230	**270**
Total	**40**	**230**	**270**

On the whole, Tables 19 and 20 show statewide FWQG application and effectiveness rating for timber harvesting. In this instance, FWQG application was met or exceeded 85% of the time with a corresponding effectiveness rating of 84%. Figure 6 displays results of the specific FWQG rated in this category.

Table 19: Statewide FWQG Application (Timber Harvesting)
Percent (%) Practices Rated

Ownership	# Rated Practices	Meet or Exceed (4 and 5)	Minor Departure (3)	Major Departure (2)	Gross Neglect (1)
Private	230	83	11	6	<1
State	40	87	8	5	--
All Sites	**270**	**85**	**9**	**5**	**<1**

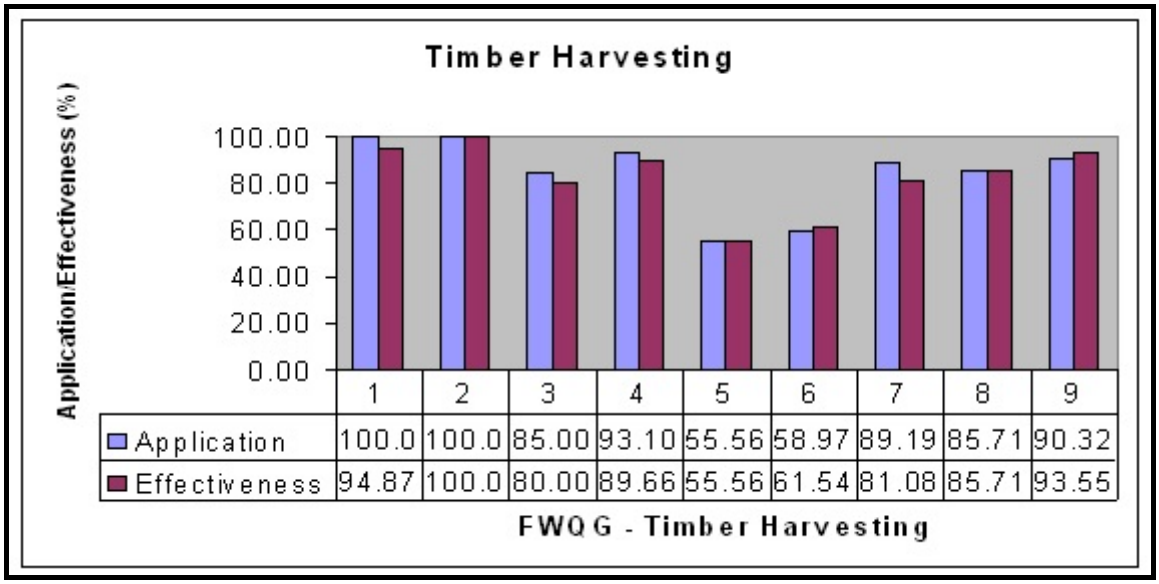
Table 20: Statewide FWQG Effectiveness (Timber Harvesting)
Percent (%) Practices Rated

Ownership	# Rated Practices	Improved Protection (6)	Adequate Protection (5)	Minor/ Temporary Impacts (4)	Minor/ Prolonged Impacts (3)	Major/ Temporary Impacts (2)	Major/ Prolonged Impacts (1)
Private	230	<1	80	15	3	2	<1
State	40	--	88	13	--	--	--
All Sites	**270**	**<1**	**84**	**14**	**3**	**2**	**<1**

Forest Water Quality Guideline (Timber Harvesting)

1. Avoid excess soil compaction.
2. Avoid the use of ground-based equipment within the SMZ. Trees harvested in the SMZ should be end-lined or winched.
3. Utilize harvesting system best suited to topography to avoid excessive compaction, damage to residual stand and ensure adequate regeneration and re-vegetation.
4. When descending steep slopes, avoid the use of skidder blades for braking purposes.
5. Adequate road and skid trail drainage structures installed prior to commencement of operations.
6. Minimize slash accumulations and prevent excessive waste of resources by adhering to pre-determined utilization standards.
7. Reduce or minimize the amount of soil in slash piles by using brush blades for piling.
8. Avoid piling and burning slash in SMZ's.
9. Locate skid trails to minimize damage to regeneration.

Figure 6: FWQG Application/Effectiveness - Timber Harvesting



CONCLUSIONS

Utah's forest and water resources are among its most valuable assets. Successful implementation of environmental protection programs have made great strides in minimizing non-point source pollution while improving water quality throughout the state. With forest management activities the most concerning non-point source pollutant is sediment, particularly from activities related to roads. Carefully applied, implementation of Utah's FWQG - which promote the protection of water quality - serves an important function in maintaining this valuable resource.

Overall results indicate Utah's FWQG are being applied at a relatively high rate and providing adequate protection to forest, soil and water resources. While not completely effective, careful use and application of the FWQG can dramatically reduce water quality impacts. Results also suggest there are areas where FWQG application and effectiveness could be improved. Other states with comparable monitoring processes continually show compliance results ranging between 95% and 98%. Whereas this report provides baseline data for Utah's FWQG Monitoring Program, much of the success by other states is due to years of continued monitoring and continuing education for loggers, landowners and resource managers. With this report, Utah's benchmark has been established, and is now in a position to build upon its success to continue implementing an effective FWQG Monitoring Program that can remain voluntary in combination with existing policies, continuing education and training.

Utah's FWQG Monitoring Program will continue to rely heavily on operator compliance with the Utah Forest Practices Act - Notification of Intent to Conduct Forest Practices requirement. While the number of NOI received has gradually increased over the past three years, the Division is concerned about the declining level of compliance with the FPA - Notification of Intent requirement. Effective monitoring of the FWQG cannot proceed without the confidence of knowing where timber harvesting activities are occurring or to what degree the FWQG are being implemented. Consequently, describing future results and trends toward improving FWQG implementation will be difficult.

The FWQG monitoring process has proved to be a positive and productive approach to dealing with a complex issue. FWQG audits provide a mechanism for identifying and documenting important forest management issues which are directly related to sustaining the productive capacity of Utah's forests while continuing to provide abundant, clean water to Utah's citizenry. Continued support and involvement of key stakeholder groups is necessary to make Utah's FWQG Monitoring Program more effective and practical with subsequent monitoring efforts.

RECOMMENDATIONS

This report provides benchmark information on FWQG application and effectiveness. The following recommendations focus on suggested improvements for continued FWQG monitoring.

General

- Increase involvement of loggers, landowners and foresters involved in forest practices administration to join the monitoring teams during field audits. This will help them understand the FWQG and augment important information exchange.
- Extend training and education of loggers, landowners and resource managers based on problem areas identified in the audit process. This will ensure expectations for applying FWQG standards are met.

Planning for Roads

- Avoid sustained excessive grades of 10-20%. Clarify the term “excessive.” If roads are constructed correctly, a road at this grade would be appropriate.
- Further clarification is needed during the audit process to account for pre-existing roads that may have been reconstructed or used as is.
- Determine audit process for pre-existing and poorly located roads.
- Provide further guidance for road surface drainage on roads that are being used for different purposes.

Road Maintenance

- Avoid cutting the toe of cut slopes when grading roads or pulling ditches. Consideration of slope as an issue if below the angle of repose.

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